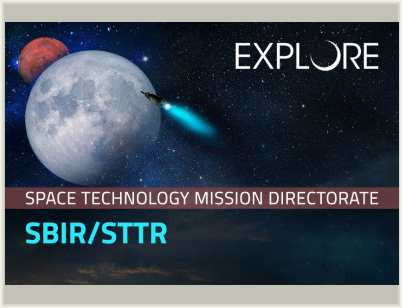
Advanced Structural Nanomaterials for Astronaut Radiation Protection, Phase II

Completed Technology Project (2005 - 2007)

Project Introduction

Zyvex in cooperation with Prairie View A&M (CARR) and Boeing will develop a space radiation shielding multi-functional material that will provide high energy radiation shielding required to protect astronauts on extended missions, strong enough to be used as an integral structural material and tough enough to survive micro-meteor impacts, provide EMI shielding, and enhanced thermal conductivity. The team will also develop an improved protocol for testing radiation shielding material. This effort will entail developing a composite material which uses proven radiation shielding material Polyethylene(PE), as its primary constituent in the form of very strong/tough Spectra fibers woven into a 3D fabric. In Phase 1 we demonstrated that, compared to bulk PE, this composite approach has significantly improved mechanical properties, excellent electrical conductivity, good Electro Magnetic Interference (EMI) shielding properties, and maintains excellent space radiation shielding properties of PE. We also demonstrated exposure to large doses of high energy actually improved the mechanical properties. In Phase II, the epoxy matrix used in Phase I will be considered along with Cyanate Esters, and Polyimides, As in Phase I, coating the PE fabric and reinforcing the matrix material will be ultra-high strength, highly conductive carbon nanotubes (CNTs). Zyvex's unique and commercially successful CNT processing technology will be adapted to maximize the transfer of the extraordinary mechanical, electrical, and thermal properties of CNTs to the composite structures. The work plan includes approaches to overcome CNT processing and delamination issues discovered in Phase I. CARR will carryout more extensive radiation testing with several ions at different energies. Boeing which has significant interest in developing long term space exploration will guide the development of the material to meet specifications for planned applications.



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Marshall Space Flight Center (MSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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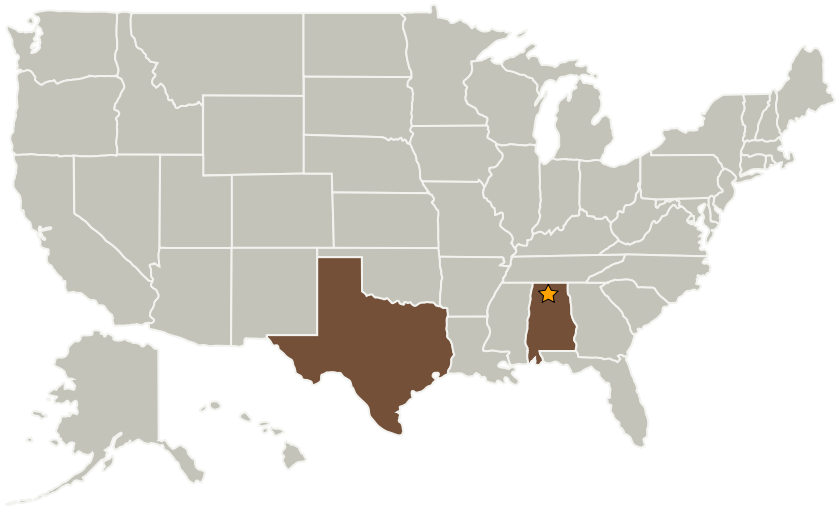
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Marshall Space Flight Center(MSFC)	Lead Organization	NASA Center	Huntsville, Alabama
ZYVEX Corporation	Supporting Organization	Industry	Richardson, Texas

Primary U.S. Work Locations	
Alabama	Texas

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.3 Thermal Protection Components and Systems
    - TX14.3.1 Thermal Protection Materials